



The brachymorph mouse and human evolution

Citation

Brown, Jevon J. Y., A. Ford-Hutchinson, Frank R. Jirik, Daniel E. Lieberman, Benedikt Hallgrímsson. 2005. The brachymorph mouse and human evolution. *American Journal of Physical Anthropology* 126(S40): 79.

Published Version

<http://dx.doi.org/10.1002/ajpa.20217>

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:2797437>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

The brachymorph mouse and human evolution

Jevon J. Y. Brown, A. Ford-Hutchinson, Frank R. Jirik, Daniel E. Lieberman, Benedikt Hallgrímsson

Abstract:

The degree to which evolutionary change in the cranial base was an integrative influence on other aspects of craniofacial evolution in hominids is a subject of much debate. Using a mouse model, we test the hypothesis that a mutation which produced a shortening of the cranial base creates some of the same changes seen in hominid evolution, such as increased cranial flexion, retraction of the face and increased neurocranial height. The Brachymorph (bm) mutant mice possess an autosomal recessive mutation that affects the sulfation of cartilage matrix glycosaminoglycans, initiating hyper-ossification and stunting of endochondral bone. In the cranium, this produces a reduction of the size of the basicranium. We obtained 3D reconstructions of brachymorph mutants (N=21) and wildtype littermates (N=19) using computed microtomography and performed morphometric analysis of 3D landmarks. Principal components analysis of Procrustes coordinates for the combined sample revealed a clear separation in shape for the two groups as well as shape variation consistent with the hypothesis. Euclidean distance matrix analysis revealed that the Brachymorph mutants had a significantly shorter (>10%) cranial base (at $p=.05$), as well as a significant increase in neurocranial height (>10%). We also found a significant increase in both cranial base flexion ($t=3.899$, $df=25$, $p<<.05$) and facial retraction ($t=-3.157$, $df=24$, $p<<.05$). These results demonstrate that the Brachymorph mutation produces cranial characteristics that mirror some of the changes seen in hominid evolution. This study provides evidence, in the mouse model, which suggests an integrative role for the basicranium in human evolution.